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## PATENT ABSTRACTS OF JAPAN

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(54) WASTE GAS PURIFYING FILTER AND WASTE GAS PURIFYING DEVICE USING THE SAME

(57)Abstract:

PURPOSE: To provide a waste gas purifying filter capable of preventing the occurrence of crack and erosion at the boundaries between partition walls and sealing parts and a waste gas purifying device using the same.

CONSTITUTION: This filter is used for removing solid particles consisting essentially of carbon from waste combustion gases and is the waste gas purifying filter 1 in the form of alternately sealing both ends of honeycomb shapes by the sealing parts 5. The waste gas purifying filter is so constituted that the sealing thickness of the sealing part 5 disposed at both ends is substantially nonuniform. The waste gas purifying filter 1 is fixed into a boiler proper.



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## CLAIMS

## (57) [Claim(s)]

[Claim 1] an emission gas purification filter characterize by eye closure thickness of the eye closure section which be a filter for remove a solid particulate which use carbon as a principal component , and formed both ends of a honeycomb configuration in said both ends in an emission gas purification filter of a gestalt which carried out eye closure by turns by the eye closure section not be more uniform than a combustion gas , and a boundary of the eye closure section and a septum not continue by straight line or fixed pattern .

[Claim 2] An emission-gas-purification filter according to claim 1 whose thickness of said eye closure section is 1/3 or less [ of 3mm or more filter length ].

[Claim 3] An emission-gas-purification filter according to claim 1 whose eye closure thickness of the periphery section is max among said eye closure sections.

[Claim 4] An emission-gas-purification filter given in any 1 term of claims 1-3 to which said filter makes one sort chosen from cordierite, a mullite, an alumina, silicon nitride, silicon carbide, and LAS the main crystal phase.

[Claim 5] A coefficient of dispersion of thickness of said eye closure section [External Character 1]  
 $\times / \sigma_{n-1}$

An emission-gas-purification filter given in any 1 term of claims 1-4 which are 35 or less \*\*.

[Claim 6] An exhaust gas purifying facility characterized by fixing an emission-gas-purification filter given in any 1 term of claims 1-5 in a can.

[Claim 7] An exhaust gas purifying facility according to claim 6 which carries out end-face grasping at least of one side of passage of a filter of said honeycomb configuration by retainer, and performs said immobilization.

[Claim 8] An exhaust gas purifying facility according to claim 6 or 7 which performs playback of said filter by combustion by burner, an electric heater, etc.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the exhaust gas purifying facility using the emission-gas-purification filter and it which are used in order to remove the solid particulate which uses carbon as a principal component from the combustion gas discharged from a diesel power plant.

[0002]

[Description of the Prior Art] In order to remove from the former the solid particulate which uses carbon as a principal component from the combustion gas discharged, for example from a diesel power plant, eye closure of the both ends of a honeycomb configuration is carried out by the eye closure section by turns, and the emission-gas-purification filter which made two or more passage of a honeycomb configuration blockade by turns at the upstream or the downstream edge is used.

[0003] With the filter of the quality of cordierite currently used with this kind of emission-gas-purification filter, even if it creates a filter and the eye closure section with this quality of the material, cordierite has an anisotropy in thermal expansion, and generally, the filter section uses the technology to which the orientation of the direction in a cordierite crystal where low thermal expansion is obtained most is made to carry out in the direction of passage in order to perform low thermal-expansion-ization of the direction of passage. [ most ] On the other hand, since the eye closure section cannot carry out orientation of the cordierite crystal, it brings a result from which thermal expansion differs in the eye closure section and the filter section. Moreover, even if it uses as a filter the other quality of the materials, for example, an alumina, and the quality of the material which does not have an anisotropy in thermal expansion like silicon nitride, in the filter section and the eye closure section, thermal expansion does not serve as homogeneity, but since the eye closure section of reinforcement is thicker than the filter section, the eye closure section becomes strong. Therefore, if a thermal shock joins the filter section, stress will bring a result concentrated on the boundary of the eye closure section and the filter section, and it will be easy to generate a crack here. The case which the eye closure section and the filter section separate as extremeest case happens.

[0004]

[Problem(s) to be Solved by the Invention] Therefore, as indicated by the case (refer to drawing 5 ) where the thickness of the eye closure section is uniform like before, and the filter toe of the eye closure section is located in a line in the shape of a straight line, JP,2-63020,U, and the JP,61-10917,U official report Although the erosion of the filter with which the self-ignition of a deposition soot etc. is considered to be a factor by having a pattern which makes the filter toe of the eye closure section thick one by one in the center from a periphery (referring to drawing 6 ) can be prevented Since it has the pattern with a simple filter toe when a thermal shock occurs, stress concentrates according to the pattern and prevention of a crack cannot be prevented like the conventional example.

[0005] On the other hand, in JP,61-138812,A, by shifting the eye closure section of next doors mutually in a downstream edge, it is easy to deposit a soot directly under the downstream eye closure section, and the technology of preventing an erosion is indicated by shifting an exoergic location when these burn.

By this method, the erosion of the filter downstream by combustion of a soot can be prevented. However, when a thermal shock occurs, generally combustion playback is reproduced by preparing a burner, an electric heater, etc. in an entrance side, but in order to contact the flame of a burner, and a heater at the filter entrance edge directly, when playback is ended, a thermal shock happens. With this technology, it cannot perform preventing the crack at the time of such thermal shock generating in an entrance side.

[0006] The purpose of this invention tends to cancel the technical problem mentioned above, and tends to offer the emission-gas-purification filter which can prevent generating and the erosion of a crack in the boundary of a septum and the eye closure section, and the exhaust gas purifying facility using it.

[0007]

[Means for Solving the Problem] an emission gas purification filter of this invention do not have eye closure thickness of the eye closure section which be a filter for remove a solid particulate which use carbon as a principal component, and formed both ends of a honeycomb configuration in said both ends in an emission gas purification filter of a gestalt which carried out eye closure by turns by the eye closure section more uniform than a combustion gas, and be characterize by a boundary of the eye closure section and a septum not continue by straight line or fixed pattern.

[0008] Moreover, an exhaust gas purifying facility of this invention is characterized by fixing in a can an emission-gas-purification filter of structure mentioned above.

[0009]

[Function] In the configuration mentioned above Since the eye closure thickness of the eye closure section is substantially uneven, The boundary of the eye closure section and a septum does not continue by the shape of a straight line, and the fixed pattern. Therefore, the portion which the portion and heat of combustion which carry out stress concentration by the thermal shock concentrate will not continue, stress and heat of combustion are distributed, and generating (upstream and downstream) and the erosion (mainly downstream) of a crack by the thermal shock can be prevented. Moreover, if an exhaust gas purifying facility is constituted using this emission-gas-purification filter, the exhaust gas purifying facility which bears a thermal shock too can be constituted.

[0010] In addition, although it is not limited, when thickness of the eye closure section is set to 3mm or more, since an eye sealing agent is not omitted and especially the thickness of the eye closure section can secure sufficient reliability, it is desirable. Moreover, the thickness of the eye closure section of the periphery section is still more desirable in it being 10mm or more also among the eye closure sections. This is for it being desirable to carry out an end-face seal, and it minding a retainer in this case, in order to prevent a gap of a filter and seal leakage, and securing the reinforcement of a periphery end face. Furthermore, since the effective area of a filter becomes small, and the thickness of the eye closure section will become a filter inferior to the filter engine performance even if it is excellent in thermal shock resistance if it does not carry out to 1/3 or less [ of a filter ], it is desirable to make a maximum or less [ of a filter ] into 1/3.

[0011] Moreover, the exhaust gas purifying facility using the emission-gas-purification filter of a configuration of having mentioned above can turn into equipment which was excellent in thermal shock resistance and was excellent also in seal nature, and the playback method of filters, such as the back wash playback method and the combustion playback method, cannot be asked, but the exhaust gas purifying facility in which a good filter shape is shown can be obtained.

[0012]

[Example] Drawing 1 is drawing showing the configuration of an example of the emission-gas-purification filter of this invention, and drawing 1 (a) shows the cross section which met the A-A line [ in / for the end face / in drawing 1 (b) / drawing 1 (a) ], respectively. In drawing 1, the emission-gas-purification filter 1 of this invention carries out eye closure of the both ends of the upstream of the ceramic honeycomb structure object 4 which consists of a through tube 3 which consisted of many septa 2, and the downstream by turns in the eye closure section 5, and is constituted. That is, while carrying out eye closure of the through tube 3 in the edge of the upstream or the downstream so that the eye closure section 5 may serve as a checkered pattern as shown in drawing 1 (a), if its attention is paid

about each through tube 3, the eye closure of the edge of either the upstream or the downstream is carried out by the eye closure section 5.

[0013] It is the point constituted from this invention so that an important thing might become uneven substantially about the thickness of the eye closure section 5 which stops the edge of a through tube 3. An ununiformity means that the thickness of the eye closure section is not uniform, i.e., it is mutually thick or are thin, here. However, as the example is shown in drawing 2 and drawing 3, even if the thickness of the \*\*\*\*\* closure section is partially uniform, the whole eye closure thickness should just be an "ununiformity" substantially. Furthermore, as a suitable example, it is uneven and an eye closure portion is the coefficient of dispersion [outside 2] of eye closure thickness.

$\sigma / \sigma_{n-1}$

It is good that it is 35 or less \*\*. A coefficient of dispersion shows the variation degree to the average value of eye closure thickness, by producing the variation in eye closure thickness so that it may become 35 or less with a coefficient of dispersion (variation is so large that it is small), stress distributes and the so-called stress concentration side of it is lost. Generating of a crack can be inhibited more by this at the time of a thermal shock.

[0014] In addition, since this invention is aimed at the exhaust gas mainly discharged from a diesel power plant as a ceramic material which constitutes the ceramic honeycomb structure object 4, it is desirable to use the material excellent in thermal resistance, therefore it is desirable to use the ceramic material which makes one sort chosen from cordierite, a mullite, an alumina, silicon nitride, silicon carbide, and LAS the main crystal phase. Especially, it is cheap, and the ceramic honeycomb structure object 4 which makes cordierite the main crystal phase is excellent in thermal resistance and chemical resistance, and the most desirable.

[0015] Moreover, it is desirable in 3mm or more and a periphery portion being 10mm or more also in a portion with the thinnest thickness of the eye closure section 5 which is the length in the through tube 3 of the eye closure section 5. moreover, the maximum of the thickness of the eye closure section 5 -- a filter -- it is desirable that it is 1/3 or less [ of length L of the ceramic honeycomb structure object 4 ] here. Furthermore, it is desirable, when thickness of the periphery eye closure section is made the thickest as 40mm and internal thickness is set to 15 to 40mm. Here, in the end face of the ceramic honeycomb structure object 4 indicated to be a periphery portion and the interior to drawing 1 (a), it has a relative relation, for example, the portions of the interior and the other outside can be called a periphery portion less than for 3/4 of a radius.

[0016] The formation method of the ceramic honeycomb structure object 4 and the formation method of the eye closure section 5 dry the honeycomb structure object 4 which could use the well-known method from the former, for example, carried out extrusion molding, and after they pour in and prepare the ceramic paste of this quality of the material in the both ends in predetermined thickness at each through tube 3, they can form it by calcinating further again.

[0017] By discharging to the exterior from the through tube 3 which supplies the combustion gas containing the solid particulate which uses as a principal component the carbon discharged, for example from a diesel power plant with the emission-gas-purification filter 1 of a configuration of having mentioned above to the emission-gas-purification filter 1 from the through tube 3 in which the upstream is carrying out the opening, is made to pass a septum 2, and is carrying out the opening of the downstream, uptake of the solid particulate which uses the carbon in exhaust gas as a principal component can be carried out, and a septum 2 can remove it.

[0018] And although the temperature generated at the time of the playback in the combustion playback method and self-ignition is about 1000 degrees C and requires a thermal shock 700 degrees C or more as thermal shocks at the time of engine starting etc., with the emission-gas-purification filter 1 concerning the invention in this application, heat of combustion and a stress concentration part cannot follow the boundary of edge 5a of the eye closure section 5, and a septum 2 in the shape of a straight line, but it can prevent generating and the erosion of the crack of this portion.

[0019] Drawing 4 is drawing showing the configuration of an example using the emission-gas-

purification filter of this invention of an exhaust gas purifying facility. In the example shown in drawing 4, the exhaust gas purifying facility 11 of this invention fixes the emission-gas-purification filter 1 of the structure shown in drawing 1 in the metal can 12, and is constituted. The can 12 has established the exhaust gas entrance 13 and the exhaust gas outlet 14 of a cone cup configuration in both ends.

Moreover, immobilization of the emission-gas-purification filter 1 into a can 12 is attained by forming a retainer 16 in the periphery section of the emission-gas-purification filter 1, and carrying out end-face grasping while fixing to the inside of a can 12 through the ceramic mat 15.

[0020] Like the example shown in drawing 4, when using a retainer 16, the crack of the honeycomb structure object 4 by using a retainer 6 etc. can be prevented with constituting the thickness of the eye closure section 5 of the periphery portion covered by the retainer 16 among the eye closure sections 5 of the honeycomb structure object 4 so that it may become the maximum thickness by 10mm or more preferably. Moreover, the erosion of the upstream edge by the combustion flame at the time of generating of the crack in the upstream and a downstream edge or playback or the heat of an electric heater can be prevented by making uneven eye closure thickness of the both ends of the honeycomb structure object 4.

[0021] Hereafter, the effect of the coefficient of dispersion in eye closure thickness was actually investigated.

It prepared by having set the example cordierite-ized raw material by the cordierite theoretical presentation, mixed kneading of this was carried out, and the Plastic solid of a honeycomb configuration was acquired by extrusion molding. It calcinated at 1400 degrees C to the acquired Plastic solid, and considered as the nature honeycomb structure object of cordierite. According to the following table 1, the line obtained the filter of a honeycomb configuration for the eye closure which changed the coefficient of dispersion by making this into a sample. filter size -- 430 micrometers in 150mm in the diameter of 120mm, and thickness, 15.5 cels / cm<sup>2</sup>, and septum thickness it was.

[0022] Thermal shock resistance was measured about the obtained filter. Here, the filter was held for 30 minutes in the electric furnace heated by constant temperature as the evaluation method of thermal shock resistance, it quenched to the room temperature after that, and temperature from which the crack was discovered visually was made into a heat-resistant impact temperature. Moreover, by the judgment by viewing, when good, 25-degree-C temperature was raised, the same trial was performed, and it repeated until the crack occurred. In addition, it made the number of trials each into three pieces, and those averages showed it. A result is shown in a table 1.

[0023]

[A table 1]

試験区分	平均厚さ (mm)	目封止厚さ 標準偏差	分散係数	耐熱衝撃温度 (℃)
T-1	5.0	0.125	40	692
T-2	5.0	0.132	38	708
T-3	5.0	0.143	35	750
T-4	5.0	0.172	29	767
T-5	30.0	0.732	41	683
T-6	30.0	0.811	37	692
T-7	30.0	0.857	35	758
T-8	30.0	1.000	30	792
T-9	30.0	2.143	14	800

[0024] If a heat-resistant impact temperature is 750 degrees C or more, the thermal shock resistance at the time of playback will serve as satisfactory level on real use. If the result of a table 1 is seen from this



viewpoint, if a coefficient of dispersion exceeds 35, a heat-resistant impact temperature will decrease rapidly, and it will worry about the crack initiation by the thermal shock in the time of real use at the time of playback etc. On the other hand, if a coefficient of dispersion is made or less into 35, sufficient heat-resistant impact temperature will be acquired, and there is no fear of a crack occurring by the thermal shock also in the playback at the time of real use etc.

[0025]

[Effect of the Invention] According to this invention, by making \*\* into an ununiformity substantially in the eye closure thickness of the eye closure section so that clearly from the above explanation The boundary of the eye closure section and a septum does not continue by the shape of a straight line, and the fixed pattern. Therefore, the portion which the portion and heat of combustion which carry out stress concentration by the thermal shock concentrate will not continue, stress and heat of combustion are distributed, and generating (upstream and downstream) and the erosion (mainly downstream) of a crack by the thermal shock can be prevented. Moreover, if an exhaust gas purifying facility is constituted using this emission-gas-purification filter, the exhaust gas purifying facility which bears a thermal shock too can be constituted.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the configuration of an example of the emission-gas-purification filter of this invention.

[Drawing 2] It is drawing showing the configuration of other examples of the emission-gas-purification filter of this invention.

[Drawing 3] It is drawing showing the configuration of the example of further others of the emission-gas-purification filter of this invention.

[Drawing 4] It is drawing showing the configuration of an example using the emission-gas-purification filter of this invention of an exhaust gas purifying facility.

[Drawing 5] It is drawing showing the configuration of an example of the conventional emission-gas-purification filter.

[Drawing 6] It is drawing showing the configuration of other examples of the conventional emission-gas-purification filter.

[Description of Notations]

1 Emission-Gas-Purification Filter, 2 Septum, 3 Through Tube, 4 Ceramic Honeycomb Structure  
5 Eye Closure Section

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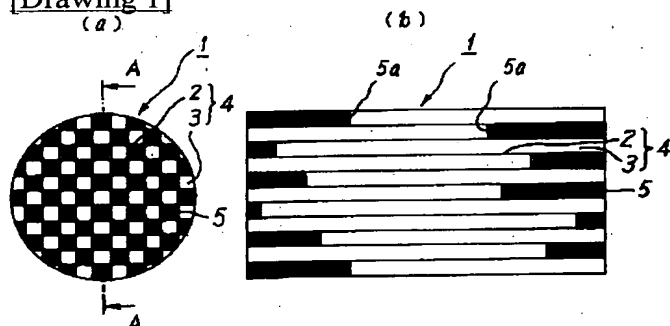
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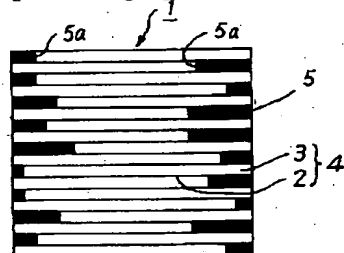
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## DRAWINGS

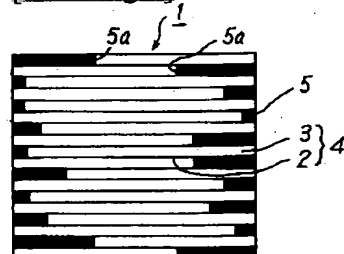
[Drawing 1]



[Drawing 2]

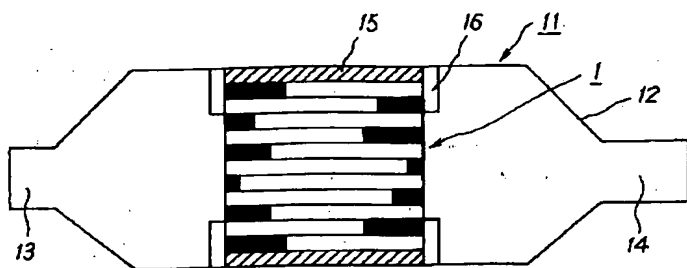


[Drawing 3]

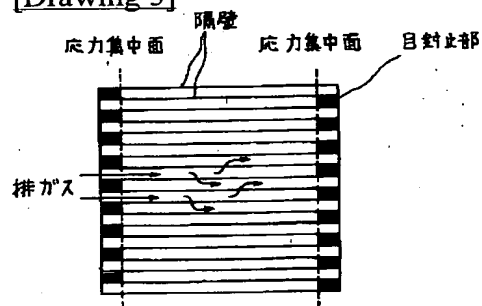


[Drawing 4]

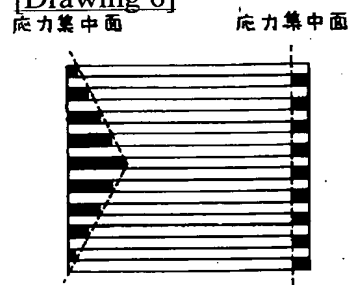




[Drawing 5]



[Drawing 6]



[Translation done.]